

Student Feedback on Problem Stimulated Learning in Pharmacology: A Questionnaire based Study

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At the Manipal College of Medical Sciences (MCOMS), Pokhara, Nepal a mixture of didactic lectures and problem-stimulated learning (PSL) is used to teach pharmacology. The present study was carried out to obtain information on student attitudes towards PSL in pharmacology and note any differences in attitudes due to demographic factors, graduation, medium of instruction at school, previous exposure to and importance of self-learning at school. Fourteen statements regarding PSL were given and the respondents were asked to indicate the extent of their agreement using a modified Likert-type scale. The fourth semester students were invited to participate in the study by notices and announcements. Of the 200 fourth semester students, 150 (75%) completed the questionnaire. The Mann–Whitney *U* test was used to analyze differences between the groups. Female students ($p = 0.85$), English medium students ($p = 0.61$) and students with exposure to problem-based learning (PBL) ($p = 0.82$) had a higher median score which was not statistically significant. Students from schools where self-learning was important had a more positive opinion regarding PSL ($p = 0.005$). Involvement of other departments and problem-based assessment will be helpful to the faculty in considering a problem from different perspectives and will make PSL a more integrated and effective method of learning for the students.

Keywords: Educational measurement; Medical education; Problem-stimulated learning; Pharmacology teaching; Student attitudes

INTRODUCTION

Medical students, as future doctors, should have adequate training to choose drugs for different disease conditions. Traditional teaching in pharmacology is characterized by the transfer of knowledge about drugs and memorization of details about drug classes and individual compounds

(Snell, 1992; Michel *et al.*, 2002). The teaching takes place often in the form of lectures and this poorly equips students with the skills necessary to rationalize drug therapy in practice (Walley *et al.*, 1994). Evidence suggests that a more problem-based approach to pharmacology and therapeutics helps to develop reasoning skills and prepares the student for clinical practice (Davis and Harden, 1998; Spencer and Jordan, 1999).

Problem-based learning (PBL) was originally introduced at McMaster University in Canada and has been gaining ground as a tool of reform in medical education (Nandi *et al.*, 2000). The term PBL is often not clearly defined and is used to designate heterogeneous forms of learning (Maudsley, 1999). PBL satisfies certain important criteria that promote optimal learning. The learning is activity based and the student receives feedback and support from other students and the instructors (Albanese and Mitchell, 1993). Learning occurs through multiple interactions within the learning environment (Savery and Duffy, 1995). Learning is based on solving a real problem and on a foundation of collaboration and integration within a small group context (Camp, 1996).

The use of PBL varies between medical schools; some have completely switched their curriculum to PBL whereas others have used various hybrid approaches between PBL and traditional lecture-based learning (LBL) (Michel *et al.*, 2002). In Nepal, the Kathmandu University Medical School follows problem-based curricula for the Bachelor of Medicine and Bachelor of Surgery course (MBBS) and has switched over to PBL with very few didactic lectures. The Institute of Medicine at Kathmandu and the BP Koirala Institute of Health Sciences at Dharan in

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eastern Nepal use a combination of didactic lectures and PBL/problem-stimulated learning (PSL) for teaching medical students. The assessment of students at Dharan is carried out using a system-based problem solving approach. In Pakistan, PBL was introduced at Ziauddin Medical University, Karachi, while most of the other medical schools follow a conventional educational program (Jaleel *et al.*, 2001). In Mymensingh Medical College, Bangladesh, PBL is proposed to be introduced in the undergraduate medical curriculum (Rahman *et al.*, 2004).

At MCOMS, pharmacology is taught in an integrated manner with the other basic science disciplines of anatomy, physiology, biochemistry, pathology, microbiology and community medicine. The subject is taught in an integrated manner under an organ-system based curriculum. Pharmacology is taught during the first two years of the MBBS course and there is little formal exposure to clinical pharmacology and therapeutics during the clinical years.

At MCOMS, we follow a hybrid approach to teaching pharmacology with didactic lectures and PSL. PSL sessions are of two and a half hours duration and are held once a week. MCOMS has an international student body with students from Nepal, India, Sri Lanka and a few students from other countries. The faculty of the Department of Pharmacology with the help of faculty members from the Departments of Internal Medicine, Community Medicine and other departments design problems in pharmacology and therapeutics, which will be solved by the students. We concentrate on the health problems of Nepal and pay special emphasis to the essential drug list of Nepal while choosing "P-drugs" for different diseases. Essential medicines are those that satisfy the priority health needs of the population. They are selected with due regard to public health relevance, evidence of efficacy, safety and comparative cost-effectiveness. They should be available at all times in adequate amounts (Report of the WHO Expert Committee, 2002). The third revision of the National list of Essential Drugs (Nepal) was carried out in 2002. In Nepal, there are separate lists of essential drugs for the national, district, primary health centre, health post and sub-health post level (His Majesty's Government, Department of Drug Administration, 2002). Primary health centres, health posts and sub-health posts are different levels of primary health care delivery in Nepal. P-drugs or personal drugs are the drugs, which are chosen by a prescriber for a particular disease condition. Each prescriber should have a list of P-drugs for different disease conditions and this will enable him/her to have a thorough knowledge of those drugs. Efficacy, safety, cost and suitability are criteria in choosing a P-drug.

We have not termed the learning sessions in pharmacology as PBL for two reasons. First,

the students do not acquire basic knowledge of pharmacological principles through problem exploration and rely for these on teacher-centred didactic lectures. Second, the problems given to the students are followed by a set of questions, which steer student learning in a specific way. A combination of didactic lectures with problem-based learning sessions has been used for physiology teaching in our medical college (Ghosh and Dawka, 2000).

Though PSL has been a teaching methodology at our institution for over five years, the method has not been formally evaluated. In keeping with global trends, the revised curriculum of Kathmandu University recommends reduction in the factual content of medical courses and places a greater emphasis on problem-based curricula and self-directed learning (Mifflin *et al.*, 2000; Kathmandu University, 2001). PBL/PSL depends on the effectiveness of the small group interaction to enhance learning (Kalian and Mullan, 1996). Our students come from different educational, cultural and socio-economic backgrounds and there may be difficulties in working together as a team. The present study was carried out to evaluate the opinion of medical students regarding PSL in pharmacology at MCOMS, Pokhara.

The objectives of the study were to:

1. Obtain basic demographic information on the student respondents and note any association of the PSL score with demographic characteristics;
2. Obtain information on the extent to which the students think that the objectives of PSL were realized by using a questionnaire consisting of 14 statements which were scored using a modified Likert-type scale and;
3. Analyze any differences due to sex, nationality, graduation, medium of instruction at school, previous exposure to PBL and the importance accorded to self-learning at school on student rankings of PSL.

METHOD

Each intake at MCOMS consists of 100 students and the students are divided into four groups of 25 students each for PSL sessions in pharmacology. Each group is then further divided into two subgroups of about 12 students when the facilitator introduces the problems.

Each PSL session is two and a half hours in duration. During the first session, the students are given a set of four or five problems related to a particular topic or organ system. A student is elected as the team leader. The students discuss the problems, list the major therapeutic objectives, select their "P-drugs", start the treatment and discuss

the information to be given to the patient. The economic considerations are also kept in mind. These are illustrated by the questions, which follow a proforma (see specimen problem in the Appendix). The students are given self-study time and present their solution of the problem. The group leader summarizes the discussion and the facilitator adds any points missed by the students. We try to avoid didactic lectures, as far as possible during the PSL sessions. A study module consists of topics or diseases belonging to a particular organ or body system.

Student feedback on the PSL sessions in pharmacology was obtained using a questionnaire, which was given to the 2000 intake in September 2002 and to the 2001 intake in September 2003. The students were in the fourth semester of the MBBS course. The year of the intake refers to the year in which they gained admission to the MBBS course. The classes for the intake start in the following year, e.g. for the 2000 intake, the classes had started on January 2001. The fourth semester was chosen, as the students had been exposed to PSL in pharmacology for more than three semesters and were in a position to form an opinion about the PSL process. Demographic details such as age, sex and nationality were noted. Information on whether the students had graduated or not, the medium of instruction at school, their previous exposure to PBL at school and the importance accorded to self-learning at school were recorded. The second part of the questionnaire consisted of 14 statements. The students were asked to rank their agreement with the statement from 1 to 5 according to the following key: 1-strongly disagrees with the statement, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. The questionnaire is provided in the Appendix.

The data was analyzed using SPSS package (version 9.0 for windows). The data from the two intakes were combined and a median score for the 14 statements was calculated for each individual student. Differences in the median score according to demographic factors, medium of instruction at school, previous exposure to PBL in school and importance of self-learning at school were analyzed using the Mann-Whitney *U* test. Differences in the score of individual statements were also analyzed similarly. A *p* value <0.05 was taken as statistically significant. Differences in the median score between the 2000 and 2001 intakes were also analyzed using the Mann-Whitney *U* test.

RESULTS

A total of 80 fourth semester medical students from the 2000 intake and 70 students from the 2001 intake completed the questionnaire, the response

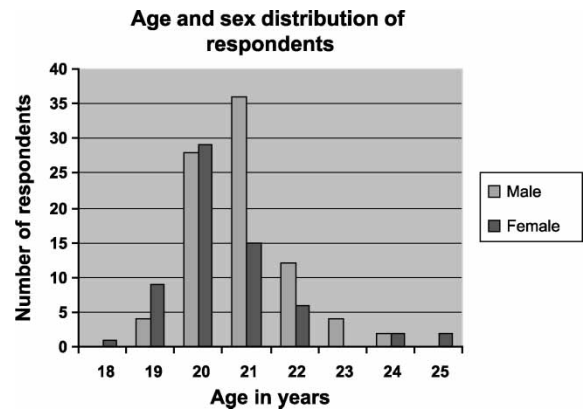


FIGURE 1 Age and sex distribution of the respondents.

rates being 80 and 70%, respectively. The students' ages ranged from 18 to 24 years for the 2000 intake and 19–25 years for the 2001 intake. The age and sex distribution of the overall sample is shown in Fig. 1.

The nationality distribution of the respondents were as follows: Nepalese (68 respondents), Indians (71 respondents), Sri Lankans (19 respondents), others (2 respondents). Eight students had joined the MBBS course after graduating. One hundred and eighteen students (78.7%) were educated in English medium schools while the rest studied in vernacular medium schools. All the nineteen Sri Lankans were educated in the vernacular medium. In Sri Lanka around 90–95% of the students are educated in the vernacular medium (either Sinhalese or Tamil). Only about 5% of the students are educated in the English medium. Recently, many English medium schools have been opened and the situation may change in the future.

Forty-four students were previously exposed to PBL in school. Sixty-one students (40.7%) came from schools where self-learning was important. Twenty-five of the 71 Indians (35.2%) were exposed to PBL in school while seven of the 19 Sri Lankans (36.8%) had a similar exposure. Sixty-seven of the 86 male students (77.9%) and 51 of the 64 female students (79.7%) were educated in English medium schools. The median scores of the 150 students for the 14 statements are shown in Table I. All statements had a median score of four except the statement "The problems introduced one to the excitement of self-discovery" which had a score of three. The standard deviation of the scores was not calculated as the scores were not normally distributed.

The median scores of individual statements according to the nationality of the respondents are shown in Table II. Most of the statements had a median score of four. Differences were seen in statement 7 (The PSL helped to promote

TABLE I Median scores of the combined group of students

Statement	Median score
1. The contents of the PSL session linked up well with previous knowledge.	4
2. The time allotted for the session is sufficient.	4
3. The facilitator fulfilled his/her role effectively.	4
4. The problems are relevant to the course objectives.	4
5. The problems are easily understood.	4
6. The problems encouraged self-study.	4
7. The PSL helped to promote student-student interaction.	4
8. PSL helped to develop logical thinking.	4
9. PSL introduced one to the excitement of self-discovery.	3
10. PSL resulted in an increased retention of information.	4
11. PSL results in the development of an integrated knowledge base.	4
12. PSL promotes staff-student interaction.	4
13. Presentation skills are developed.	4
14. Team work and leadership qualities are encouraged.	4

student-student interaction) and statement 9 (PSL introduced one to the excitement of self-discovery). The Nepalese and Sri Lankan students had given a lower median score to statement 7 compared to the Indian students. The Nepalese students gave a lower rating to statement 9 compared to the other nationalities.

Female students had a more positive opinion regarding PSL but the difference was not statistically significant. English medium students and students exposed to PBL in school had a higher score but again the difference was not significant. The students

TABLE II Median scores of the 14 individual statements according to the nationality of the student respondents*

Statement number	Median score		
	Nepalese (<i>n</i> = 58)	Indian (<i>n</i> = 71)	Sri Lankan (<i>n</i> = 19)
Statement 1	4	4	4
Statement 2	4	4	4
Statement 3	4	4	4
Statement 4	4	4	4
Statement 5	4	4	4
Statement 6	4	4	4
Statement 7	3.5	4	3
Statement 8	4	4	4
Statement 9	3	4	4
Statement 10	4	4	4
Statement 11	4	4	4
Statement 12	4	4	4
Statement 13	4	4	4
Statement 14	4	4	4

* Since there were only two respondents from other nationalities they were not included in the analysis.

coming from schools where self-learning was important had a more positive opinion towards PSL ($p = 0.005$).

The Indian students had a more positive opinion regarding PSL, but there was no significant difference seen between male and female students, students belonging to different nationalities, graduates and non-graduates, English and vernacular-medium students. No significant differences in the scoring with regard to the exposure to PBL in school and importance of self-learning in school were noted.

There was no difference between the 2000 and the 2001 intake regarding their opinion about PSL.

DISCUSSION

PBL/PSL can help the students appreciate the importance and relevance of the acquired information for appropriate prescribing (Joshi, 1996). Irrational drug use is a documented global problem (Hongerzeil, 1995). An important strategy identified to improve drug use is orienting undergraduate medical students to the concept of rational prescribing. Deep-rooted prescribing habits of doctors are difficult to change but medical students during the early years of their course do not have such habits. This period may be a suitable time to introduce the concept of rational prescribing (Joshi and Jayawickramarajah, 1996).

In traditional discipline-based and teacher-centred pharmacology teaching there is a heavy emphasis on transferring factual knowledge about drugs. Teaching is usually "drug-centred" with the clinical reasoning behind the selection of a drug for a particular disease not explained (Jayawickramarajah, 1995).

A key qualification for present and future physicians would be the ability and motivation for life long learning. In pharmacology and therapeutics, students should be able to solve problems, prescribe appropriate drugs for a disease condition and deliver drug-related and disease-related information in a meaningful way to the patient (Shankar *et al.*, 2003).

The student opinion towards PSL in pharmacology is positive. In a previous study regarding physiology teaching in our medical college, a combination of didactic lectures with PBL sessions was found to be definitely beneficial in understanding a particular topic, relating clinical conditions to basic mechanisms and improvement of performance in the university final examination (Ghosh and Dawka, 2000).

Problem-based curricula have traditionally been considered as labour-intensive, time-consuming and expensive (Joshi, 1996). It has been questioned

whether PBL may occur at the expense of extensive resource utilization (Colliver, 2000). However, recent studies suggest that the overall student time for PBL courses is similar to that of traditional formats (Dykes *et al.*, 2001; Michel *et al.*, 2002).

At MCOMS, in pharmacology teaching there are didactic lectures where the outline of a particular topic is presented. The topics are explored further during the PSL sessions. At MCOMS a major part of the instruction in pharmacology takes place through lectures and the assessment tests focus primarily on content acquisition rather than solving clinical problems. Students spent a disproportionate amount of time preparing for the assessment tests and lose time necessary for independent study.

We have been focusing on the role of the facilitator and his/her duties through inter-departmental discussions and inputs from the Medical Education committee. Most of our facilitators have been trained in conventional curricula and have difficulty in reorienting themselves to the requirements of PBL and PSL. Unlike a South African college, MCOMS has not yet organized training workshops for facilitators (McLean, 2003).

Students who were exposed to PBL at school had a better knowledge of small group dynamics, which lie at the heart of PBL/PSL and had a better opinion regarding this system of learning. We only rated the students' agreement with 14 statements regarding PSL in pharmacology at MCOMS and did not ask them about any difficulties they might be facing while learning through PSL or their opinion on how to make PSL sessions more helpful and effective; this was a limitation of the study.

Involvement of other basic science departments and combined multidisciplinary problems may lead to a more integrated approach to learning. The clinical departments during the clinical phase of the MBBS course conduct PSL sessions but little integration exists between the different clinical departments and the clinical and the basic science departments. The examinations conducted at MCOMS and by the Kathmandu University (to which the college is affiliated) assess the students in a subject-wise fashion and factual knowledge is mainly tested. These drawbacks have to be overcome to make PSL, a more effective way of learning at MCOMS, Pokhara.

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APPENDIX: QUESTIONNAIRE ON PSL IN PHARMACOLOGY

Age: Sex: M/F **Nationality:**

Have you done your graduation?

Yes/No. If yes, then main subject

Medium of instruction at school:

English/Vernacular

Were you previously exposed to PBL/PSL in school? Yes/No

Importance of self-learning in school:

Imp./Not imp.

(For the above questions please tick the correct answer where applicable)

Rate the following statements from 1 to 5

(Use whole numbers only).

Scoring key: 1-strongly disagree with the statement, 2-disagree, 3-neutral, 4-agree, 5-strongly agree.

1. The contents of PSL session linked up well with previous knowledge.
2. The time allotted for the session is sufficient.
3. The facilitator fulfilled his/her role effectively.
4. The problems are relevant to the course objectives.
5. The problems are easily understood.
6. The problems encourage self-study.
7. The PSL sessions help promote student–student interaction.
8. PSL helps to develop logical thinking.
9. PSL introduce one to the excitement of self-discovery.
10. PSL results in an increased retention of information.
11. PSL results in the development of an integrated knowledge base.
12. PSL promotes student–staff interaction.
13. Presentation skills are developed.
14. Teamwork and leadership qualities are encouraged.

AN EXAMPLE OF A PROBLEM FOR PSL SESSION IN PHARMACOLOGY

Rajesh Adhikari is a poor farmer living in Dhampus village, Kaski district (Dhampus is a village at 1920 metres and is one of the entry points to the Annapurna trekking area). He stays in a one room house with poor ventilation and uses firewood and

kerosene for cooking. He has a wife and four daughters. The eldest daughter is studying in class X and goes to the village school. He has a small piece of land halfway down the hill and he grows paddy in the summer and millets in the winter.

He is 38 years old and since the last 2 months has been suffering from shortness of breath and tiredness. He finds it difficult to climb up from his field to his house and has to take frequent rests. His ankles are swollen especially in the evenings. He gets knee pain off and on for which he visits the local health post and is prescribed ibuprofen. He used to work as a trekking guide during the trekking season but due to his poor health he has stopped since the last one year. He smokes 3 to 4 beedis daily (beedis consist of tobacco wrapped in a leaf and then tied to be smoked like a cigarette) and drinks around 4 glasses of rakshi (rakshi is made from fermented grains and can be quite potent) daily. Physical examination shows a blood pressure of 136/96 mm Hg, ankle oedema, hepatomegaly and tachycardia.

Questions:

- (a) What is the patient's problem?
- (b) What are your therapeutic goals?
- (c) What treatment will you give the patient?
- (d)
 - (1) In case of non-drug treatment go on to the next question.
 - (2) In case you give pharmacotherapy, write a complete prescription and continue to the next question.
 - (3) If you are going to give the drug parenterally, write the route, dose, frequency and continue to the next question.
- (e)
 - (1) What information will you give the patient?
 - (2) What are your instructions to the patient?
 - (3) What are your warnings?
 - (4) When will you ask him to come again?
 - (5) Can you ask him to go to the Dhampus health post for regular followup?
- (f) How are you going to monitor the therapeutic effect?
- (g) Calculate the approximate cost of your prescription per day? Will your patient be able to afford the cost of treatment?